

Patent Claims

1. A document of value, in particular bank note, with at least one pair of luminescent substances associated to each other having a first and a second luminescent substance, which emit in a joint emission region located outside the visible spectral region, wherein the emission spectra of the first and second luminescent substance in at least a partial area of the said emission region overlap in such a way, that the emission spectrum of the first luminescent substance is characteristically complemented by the emission spectrum of the second luminescent substance.
2. The document of value according to claim 1, characterized in that the said emission region is in the range of about 750 nanometers to about 2500 nanometers, preferably about 800 nanometers to about 2200 nanometers, especially preferred about 1000 nanometers to about 1700 nanometers.
3. The document of value according to claim 1 or 2, characterized in that the first and/or second luminescent substance is formed on the basis of a doped host lattice.
4. The document of value according to at least one of claims 1 to 3, characterized in that the first and/or second luminescent substance is formed on the basis of a host lattice doped with rare earth elements.
5. The document of value according to claim 4, characterized in that the host lattice is doped with neodymium, erbium, holmium, thulium, ytterbium, praseodymium, dysprosium or a combination of these elements.
6. The document of value according to at least one of claims 1 to 5, characterized in that the first and/or second luminescent substance is formed on the basis of a host lattice doped with a chromophore, the chromophore being chosen from the group scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper and zinc.

7. The document of value according to claim 6, characterized in that at least one of the host lattices is doped with a plurality of chromophores.
8. The document of value according to at least one of claims 3 to 7, characterized in that at least one of the host lattices is formed by a mixed crystal.
9. The document of value according to at least one of claims 3 to 8, characterized in that the first and the second luminescent substance are formed on the basis of different host lattices, which have differently strong crystal fields and which each are doped with the same dopant.
10. The document of value according to at least one of claims 1 to 9, characterized in that the said partial area, in which the emission spectra of the first and second luminescent substance complementary overlap each other, has a width of 200 nanometers or less, preferably 100 nanometers or less.
11. The document of value according to at least one of claims 1 to 10, characterized in that the said partial area, in which the emission spectra of the first and second luminescent substance overlap each other, is in the range of about 850 nanometers to about 970 nanometers, or about 920 nanometers to about 1060 nanometers, or about 1040 nanometers to about 1140 nanometers, or about 1100 nanometers to about 1400 nanometers, preferably about 1100 nanometers to about 1250 nanometers, especially preferred about 1120 to about 1220 nanometers, or about 1300 nanometers to about 1500 nanometers, or about 1400 nanometers to about 1700 nanometers.
12. The document of value according to at least one of claims 1 to 11, characterized in that the first and the second luminescent substance in the said partial area each have at least one emission line, the positions of which have a distance of about 30 nanometers or less, preferably about 20 nanometers or less, especially preferred about 10 nanometers or less.

13. The document of value according to at least one of claims 1 to 12, characterized in that the coding contains a further luminescent substance, which has at least one emission line located outside the said partial area.
14. The document of value according to claim 13, characterized in that the at least one emission line lies outside the visible spectral region, the emission line preferably lying in the infrared spectral region above 1100 nanometers.
15. The document of value according to at least one of claims 1 to 14, characterized in that the coding has a plurality of pairs of luminescent substances associated to each other, as stated in the claims 1 to 14.
16. The document of value according to claim 15, characterized in that the partial areas, in which the emission spectra of the first and second luminescent substance of a pair complementary overlap each other, are different for different pairs of luminescent substances associated to each other.
17. The document of value according to at least one of claims 1 to 16, characterized in that at least one of the luminescent substances is printed onto the document of value.
18. The document of value according to claim 17, characterized in that a plurality of luminescent substances are jointly printed onto the document of value in one printing ink.
19. The document of value according to at least one of claims 1 to 18, characterized in that the document of value comprises as a substrate a printed or unprinted cotton paper.
20. The document of value according to at least one of claims 1 to 19, characterized in that the document of value comprises as a substrate a printed or unprinted plastic foil.

21. The document of value according to at least one of claims 1 to 20, characterized in that at least one of the luminescent substances is incorporated in the volume of the document of value, in particular of the substrate of the document of value.
22. The document of value according to at least one of claims 1 to 21, characterized in that the pair or the pairs of luminescent substances associated to each other are provided in geometrically arranged areas on or in the document of value.
23. The document of value according to at least one of claims 1 to 22, characterized in that the at least one pair of luminescent substances associated to each other forms a coding on or in the document of value.
24. The document of value according to claim 23, characterized in that the coding represents an information about the document of value, the information being provided in encrypted or unencrypted form.
25. A method for manufacturing a document of value according to one of claims 1 to 24, characterized in that the document of value is provided with at least one pair of luminescent substances associated to each other, which emit in a joint emission region located outside the visible spectral region, wherein the emission spectra of the first and second luminescent substance in at least a partial area of the said emission region overlap in such a way, that the emission spectrum of the first luminescent substance is complemented by the emission spectrum of the second luminescent substance.
26. The method for manufacturing a document of value according to claim 25, characterized in that at least one of the luminescent substances is added to the document of value during papermaking.
27. The method for manufacturing a document of value according to claim 25 or 26, characterized in that at least one of the luminescent substances is

added to a printing ink and is applied onto the document of value with the printing ink.

28. The method for manufacturing a document of value according to at least one of claims 25 to 27, characterized in that at least one of the luminescent substances is applied onto the document of value by a coating process.
29. The method for manufacturing a document of value according to at least one of claims 25 to 28, characterized in that at least one of the luminescent substances is added via respectively prepared mottled fibers during papermaking.
30. The method for manufacturing a document of value according to at least one of claims 25 to 29, characterized in that at least one of the luminescent substances is added via a respectively prepared security thread or security strip during papermaking.
31. The method for manufacturing a document of value according to at least one of claims 25 to 30, characterized in that at least one of the luminescent substances is applied onto the document of value, in particular adhesively bonded, via a respectively prepared self-supporting transfer element, such as a patch or label.